

~~38~~ What is claimed is:

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1 In a storage network, a method for replicating data in said storage network, said
5 method comprising the steps of:

10 identifying to a first data replication facility at a first programmable
electronic device in said storage network a first structure and a second structure
held by a storage device locally accessible to said first programmable electronic
device;

15 instructing said first data replication facility to logically group said first
structure and said second structure from said storage device to create a group;

generating a replica of said group at said first data replication facility; and

20 forwarding said replica in accordance with a communication protocol
from said first data replication facility at said first programmable electronic
device to a second data replication facility at a second programmable electronic
device in said storage network for storage by a second storage device.

2. The method of claim 1, further comprising the step of, forwarding from said first
data replication facility at said first programmable electronic device to said second data
replication facility at said second programmable electronic device information

25 identifying a storage location at said second storage device at which to store said replica.

3. The method of claim 1, wherein said first programmable electronic device
forwards said replica to said second programmable electronic device in a synchronous
manner.

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4. The method of claim 1, wherein said first programmable electronic device forwards said replica to said second programmable electronic device in an asynchronous manner.

5. The method of claim 1, wherein said communication protocol comprises the Transmission Control Protocol/Internet Protocol (TCP/IP) protocol suite.

6. The method of claim 1, wherein said first programmable electronic device and said second programmable electronic device in said storage network operate without a volume manager facility.

7. The method of claim 1, wherein said first structure comprises a first logical volume and said second structure comprises a second logical volume.

8. A method for replicating data in a storage network to update one or more data structures of a remote storage device, said method comprising the steps of:

instructing a first data replication facility of a first electronic device in said storage network to logically associate a first data structure and a second data structure held by a locally accessible storage device, wherein said logical association defines a group;

generating a replica of said first data structure and said second data structure as a said group; and

outputting said replica in accordance with a data communications protocol from said first replication facility of said first electronic device to a second replication facility of a second electronic device in said storage network to update said one or more data structures of said remote storage device.

9. The method of claim 8, further comprising the steps of, packaging with said replica, information identifying one or more storage locations for storage of said replica on said remote storage device.
- 5 10. The method of claim 8, further comprising the steps of, instructing said first data replication facility to preserve a write ordering of said first data structure and said second data structure in said group.
11. The method of claim 8, wherein said communication protocol comprises the
10 Transmission Control Protocol/Internet Protocol (TCP/IP) protocol suite.
12. The method of claim 8, wherein said first electronic device and said second electronic device in said storage network perform said replicating of data without a volume manager.
- 15 13. A readable medium holding programmable electronic device readable instructions for executing a method for replicating data in a storage network, said method comprising the steps of:
- 20 identifying to a first data replication facility at a first programmable electronic device in said storage network a first structure and a second structure held by a storage device locally accessible to said first programmable electronic device;
- 25 instructing said first data replication facility to group said first structure and said second structure from said storage device;
- generating a replica of said first structure and said second structure as a group at said first data replication facility; and
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asserting said replica in accordance with a communication protocol from
said first data replication facility at said first programmable electronic device to a
second data replication facility at a second programmable electronic device in
said storage network for storage by a second storage device locally accessible to
said second programmable electronic device.

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14. The readable medium of claim 13, further comprising the step of, forwarding
from said first data replication facility at said first programmable electronic device to
said second data replication facility at said second programmable electronic device
information identifying a storage location for said second storage device to store said
replica.

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15. The readable medium of claim 13, wherein said first programmable electronic
device forwards said replica to said second programmable electronic device in a
synchronous manner.

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16. The readable medium of claim 13, wherein said first programmable electronic
device forwards said replica to said second programmable electronic device in an
asynchronous manner.

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17. The readable medium of claim 13, wherein said communication protocol
comprises the Transmission Control Protocol/Internet Protocol (TCP/IP) protocol suite.

18. The readable medium of claim 13, wherein said first programmable electronic
device and said second programmable electronic device in said storage network operate
without a volume manager facility.

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19. The readable medium of claim 13, wherein said first structure comprises a first
group of records and second structure comprises a second group of records.

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20. The readable medium of claim 13, wherein said first structure comprises a first logical volume and said second structure comprises a second logical volume.

21. In a storage network, a method to create a replica of selected data in said storage network, said method comprising the steps of:

instructing a first data replication facility at a first electronic device in said storage network to track changes to one or more storage locations of a first storage medium that correspond to said selected data;

instructing said first data replication facility to generate said replica of said selected data based on said tracked changes to said one or more locations of said first storage medium;

placing said replica of said selected data in a data structure; and

forwarding said replica of said selected data in accordance with a communication protocol from said data structure to a second data replication facility at a second electronic device in said storage network for storage of said replica on a second storage medium by said second electronic device.

22. The method of claim 21, further comprising the step of, sending an instruction from said first data replication facility at said first electronic device to said second data replication facility at said second electronic device to initiate a process for receiving and storing said replica of said selected data.

23. The method of claim 21, further comprising the step of, halting said generation of said replica of said selected data until said replica held by said data structure is forwarded from said data structure to the second data replication facility at the second electronic device in said storage network.

24. The method of claim 21, further comprising the step of, packaging with said replica of said selected data information that identifies a storage location for storage of said replica of said selected data on said second storage medium.
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25. The method of claim 21, further comprising the step of, identifying to said first data replication facility at said first electronic device in said storage network said selected data held by said first storage medium in communication with said first electronic device.
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26. The method of claim 21, wherein said data structure comprises a queue.
27. The method of claim 21, wherein said first electronic device performs said forwarding of said replica of said selected data from said data structure to said second data replication facility at said second electronic device in a first in first out (FIFO) manner.
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28. The method of claim 27, wherein said first electronic device performs said forwarding of said replica of said selected data from said data structure to said second data replication facility at said second electronic device in a synchronous manner.
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29. The method of claim 27, wherein said first electronic device performs said forwarding of said replica of said related data from said data structure to said second data replication facility of said second electronic device in an asynchronous manner.
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30. The method of claim 21, wherein said communication protocol comprises the Transmission Control Protocol/Internet Protocol (TCP/IP) protocol suite.
31. The method of claim 21, wherein said first electronic device and said second electronic device operate without a volume manager facility.
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32. The method of claim 21, wherein said one or more locations of said first storage medium comprise one of a track, a sector, a logical volume and a logical offset into said first storage medium.

5 33. A readable medium holding programmable electronic device readable instructions for executing a method to create a replica of selected data in a storage network, said method comprising the steps of:

10 instructing a first data replication facility at a first programmable electronic device in said network to track changes to one or more areas of a first storage device in communication with said first programmable electronic device, wherein the one or more areas correspond to said selected data;

15 instructing said first data replication facility to generate said replica of said selected data based on said tracked changes to said one or more areas of said first storage device;

20 placing said replica of said selected data in a data structure; and

25 forwarding said replica of said selected data in accordance with a communication protocol from said data structure to a second data replication facility at a second programmable electronic device in said storage network for storage of said replica on a second storage device in communication with said second programmable electronic device.

30 34. The readable medium of claim 33, further comprising the step of, sending an instruction from said first data replication facility at said first programmable electronic device to said second data replication facility at said second programmable electronic device to initiate a process for receiving and storing said replica of said selected data.

35. The readable medium of claim 33, further comprising the step of, halting said generation of said replica of said selected data until said replica held by said data structure is forwarded from said data structure to the second data replication facility at the second electronic device in said storage network.

36. The readable medium of claim 33, further comprising the step of, packaging with said replica of said selected data information that identifies a storage location for said replica of said selected data in said second storage device in communication with said second programmable electronic device.

37. The readable medium of claim 33, further comprising the step of, identifying to said first data replication facility at said first programmable electronic device in said storage network said selected data held by said first storage device in communication with said first computer.

38. The readable medium of claim 33, wherein said data structure comprises a queue.

39. The readable medium of claim 33, wherein said first programmable electronic device forwards said replica of said selected data from said data structure to said second data replication facility at said second programmable electronic device in a first in first out (FIFO) manner.

40. The readable medium of claim 39, wherein said first programmable electronic device forwards said replica of said selected data from said data structure to said second data replication facility at said second programmable electronic device in a synchronous manner.

41. The readable medium of claim 39, wherein said first programmable electronic device forwards said replica of said related data from said data structure to said second

data replication facility of said second programmable electronic device in an asynchronous manner.

42. The readable medium of claim 33, wherein said communication protocol comprises the Transmission Control Protocol/Internet Protocol (TCP/IP) protocol suite.

43. The readable medium of claim 33, wherein said first programmable electronic device and said second programmable electronic device operate without a volume manager facility.

44. The readable medium of claim 33, wherein said one or more areas of said first storage device comprise one of a track, a sector, a logical volume and a logical offset into said first storage medium.

45. A method for replicating data in a distributed network to update a remote storage device with data from a local storage device, said method comprising the steps of:

instructing a first data replication facility of a first electronic device in said distributed network to track one or more locations of a local storage device that correspond to one or more identified volumes;

grouping each of said one or more identified volumes into a group by said first data replication facility;

generating a replica of said group at said first data replication facility; and

asserting said replica in accordance with a communication protocol toward a second replication facility of a second electronic device in said distributed network to update said remote storage device.



46. The method of claim 45, further comprising the step of, sending a command from said first data replication facility to said second data replication facility of said second electronic device to initiate receipt of said replica.
- 5 47. The method of claim 45, further comprising the step of, packaging with said replica information that indicates a storage location for each volume in said replica for storage on said remote storage device.
48. The method of claim 45, further comprising the step of, sending from said
10 second data replication facility to said first data replication facility an indication that said update to said remote storage device completed.
49. The method of claim 45, further comprising the step of, writing the replica to a
15 local queue for temporary storage before said asserting of said replica in accordance with said communication protocol toward said second replication facility of said second computer occurs.
50. The method of claim 45, further comprising the step of, identifying to said first
20 data replication facility of said first electronic device in said distributed network said one or more volumes of said data for said replicating of data to update said remote storage device.
51. The method of claim 47, wherein said information comprises one of a volume name and a volume number.